

# COMMUNICATIVE AND COGNITIVE PERFORMANCE OF AN INDIVIDUAL WITH RIGHT HEMISPHERE DAMAGE : A CASE REPORT

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## ABSTRACT

The right and left hemispheres specialize in different functions. The damage in the right hemisphere caused due to stroke, TBI, surgery, infection/illness and tumor are termed as Right Hemisphere Damage (RHD). This damage can lead to cognitive-communication problem such as impaired memory, attention problems, poor reasoning and

dysprosodia. This case report presents a thorough analysis of communicative-cognitive performance of an individual with right hemisphere damage consequent to Road Traffic Accident and effect on contra-coup injury on communication and recovery of communicative- cognitive functions.

**Key Words:** Traumatic Brain Injuries, cognition, case report

## INTRODUCTION

The functions of the right cerebral hemisphere are complex and diverse and can be regarded as non-dominant or minor only with regard to the linguistic abilities of the left hemisphere. Spatial and affective functions dominate the activities of right hemisphere. These functions may have originally occupied both hemispheres but became lateralized to the right by the asymmetrical acquisition of language abilities by the left hemisphere (1). Whatever the evolutionary background, damage to the right cerebral hemisphere gives rise to complex neuropsychiatric, neurobehavioral deficits (1); linguistic and extra linguistic deficits (2). The causes of right hemisphere damage (RHD) include stroke, traumatic brain injury, surgery, infection/illness and tumor.

Traumatic Brain Injury (TBI), also called as simple head injury, occurs when a sudden trauma causes damage to the brain (3). TBI can result from a closed head injury (non-penetrating head injury) or an open head injury (penetrating head injury). The leading causes of TBI are falls (28%), motor vehicle-traffic crashes (20%) and assaults (11%) (4). The complications of TBI are abrasions (scrapes), lacerations (cuts), contusions (bruises), coup injuries (trauma at the point of impact) and contra-coup injuries (trauma at the opposite side of the impact). TBI can cause changes in one or more areas such as thinking, reasoning, understanding words, remembering things, paying attention, solving problems, talking, behaving, walking, seeing and/or hearing and learning (5).

People with RHD experience communication problems that are more subtle in nature than those occur from left hemisphere damage. This is due to the fact that, in most of the population, the language centers are in left hemisphere, while cognitive functioning is often housed in the right hemisphere. Because of this, patients were not routinely

treated by speech language pathologists until recently. It is currently recognized that they frequently have both communicative and cognitive deficits which can be addressed by speech therapy (6).

## CASE REPORT:

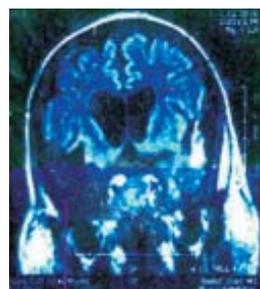
A 60-year old right-handed male was presented to the Department of Speech, Language and Hearing Sciences in June 2006 with RHD consequent to Road Traffic Accident (RTA), which occurred four years ago. He was brought to the department with the complaint of poor communicative and cognitive performance. The client's mother tongue is Telugu and other languages exposed were Tamil and English. History revealed right-sided fall resulting in closed head injury consequent to RTA (Road Traffic Accident). Details of the accident are not known.

### Pre-surgical Investigations:

CT scan of brain done in a private hospital on January 2002 revealed right temporal contusion and left parietal acute sub-dural haematoma.

### Surgery Details:

The client underwent i) emergency right temporal craniectomy and removal of contused parts, ii) left parietal burr hole and evacuation of acute sub-dural haematomas (Fig 1 and Fig 2)



Right temporal craniectomy  
Fig - 1: MRI showing right tempo craniectomy



Left parietal burr hole  
Fig -2 : MRI showing left parietal burr hole

### Post-surgical investigations:

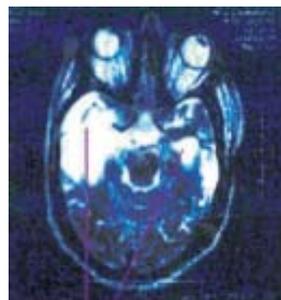
CT scan of the brain done on January 2002 showed resolving contusion with resolving edema resolved sub-dural haematoma and right internal capsule infarct. MRI of the brain

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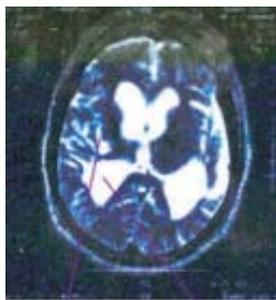
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in July 2002 (Fig 3 and 4) revealed cystic encephalomalacia in right temporal region, gliotic changes in left temporo-parietal region, old cystic lacunae in right centrum semiovale and wallerian degeneration of midbrain in right side.



Cystic encephalomalacia

Fig - 3 : MRI showing cystic encephalomalacia in right temporo - parietal and left temporal regions



Acute infarct Chronic infarct

Fig - 4 : MRI showing chronic infarct on right side

**Neuropsychological assessment** in July 2002 revealed very poor attention and eye contact, anosognosia, proposagnosia, poor facial expression, dysprosodia which are typical features of RHD. The client was advised to attend cognitive therapy for improvement of cognitive functioning of the client and the client has been attending the same since July 2002. Neurological evaluation in July 2002 revealed right third cranial nerve paresis. Right-sided hemiplegia was present. The client was advised for physiotherapy to improve the motor skills.

No speech and language evaluation had been done then. But his speech reported to be fluent and meaningless by the spouse. He was also reported to obey simple commands with gestures inconsistently. The client was brought to our clinic in May 2006 for detailed assessment of communicative abilities and for further management.

**Detailed speech and language examination** revealed the presence of right and left hemisphere symptoms. The right hemisphere symptoms noticed were poor attention and eye contact (7), impaired visuo-spatial functions and self-orientation (8), poor judgement, reasoning, short-term memory and dysprosodia (6), anosognosia (9), pragmatic and extra linguistic deficits of communication (deficits in perceptual and attentional aspects) (10). This was due to direct trauma on the right side of the brain. Left hemisphere symptoms noticed were poor auditory comprehension (6), paragrammatism (deficits in grammatical structure) (11), semantic paraphasia (substitution of one word by another within the same lexical category), fluent but meaningless speech and perseveration, naming and repetition were fair (12). Presence of left hemisphere language symptoms could be attributed to contra-coup injury. The client had undergone the following tests at the department:

**WAB (Western Aphasia Battery)** (13) was assessed to qualitatively determine the type of aphasia noticed and the areas assessed were spontaneous speech (including information content and fluency), comprehension, repetition

and naming. Table-1 elaborates WAB scores of the client. The client had an Aphasia Quotient of 50, indicative of Wernicke's aphasia. He was provisionally diagnosed to have 'Wernicke's aphasia'. Diagnostic formulation also included dysprosodia. The family members were counselled regarding the communicative deficits and the importance of Speech and language therapy and were advised to attend therapy in the department. The client is being provided with the same since May 2006 focussing on improving the communicative-cognitive performance of the client.

**Table-1: Pre and Post-Therapy WAB scores of the client**

S. No	Areas assessed	Scores	
		Pre-therapy	Post-therapy
1.	Spontaneous speech		
	i) Information content	5	6
	ii) Fluency	6	6
	<b>Total</b>	<b>11/20</b>	<b>12/20</b>
2.	Comprehension		
	i) Yes/No questions	0	10
	ii) Auditory word recognition	50	50
	iii) Sequential commands	0	10
	<b>Total</b>	<b>2.5/10</b>	<b>3.5/10</b>
3.	Repetition	44	80
	<b>Total</b>	<b>4.4/10</b>	<b>8.0/10</b>
4.	Naming	54	56
	i) Object naming	6	11
	ii) Word fluency	9	9
	iii) Sentence completion	2	5
	iv) Responsive speech	71	81
	<b>Total</b>	<b>7.1/10</b>	<b>8.1/10</b>
	Type of Aphasia	<b>Wernicke's Aphasia</b>	<b>Transcortical sensory aphasia</b>

**Table-2: Pre and Post-Therapy RICE scores of the client**

S.No	Areas Assessed	Scores	
		Pre-therapy	Post-therapy
1.	Attention	3	3
2.	Eye contact	3	3
3.	Awareness of illness	3	3
4.	Orientation to space	1	3
5.	Orientation to time	1	3
6.	Orientation to person	2	3
7.	Facial expression	2	3
8.	Intonation	1	1
9.	Topic maintenance	3	3
	<b>Total score</b>	<b>19</b>	<b>24</b>
	<b>Degree of impairment</b>	<b>Mod. severe</b>	<b>Moderate</b>

**Note:** Lesser the RICE score, greater the impairment.

**FOLLOW-UP EVALUATION/INVESTIGATIONS:**

MRI of the brain repeated on July 2006 revealed cystic encephalomalacia in right temporo-parietal and left temporal regions, secondary wallerian degeneration of midbrain on right side, chronic infarct of corona radiata and centrum semiovale on right side. Neurological assessment on July 2006 reveals resolved III CN paresis. Left sided hemiplegia is still present for which the client is undergoing physiotherapy. Neuropsychological assessment done on September 2006 revealed significant impairment of verbal comprehension and visuo-spatial functions. However improvements were noticed in terms of eye contact, attention, facial expression. Reading comprehension and simple arithmetic calculation were relatively intact. Retrograde Amnesia was present. The client was provisionally diagnosed to have 'Retrograde

Amnesia with impaired cognitive functioning' and was recommended for neuropsychological rehabilitation. Speech and Language evaluation was carried out after four months of therapy in September 2006. WAB and RICE assessments were repeated. On administering WAB, the aphasia quotient was 63.2 indicative of 'Transcortical Sensory Aphasia' (Table 1). On administering RICE, the client had a total score of 24 indicative of 'Moderate level of impairment' (Table 2).

**DISCUSSION:**

After four months of therapy, the client's cognitive functions and overall communicative effectiveness have improved. Pre therapy and post therapy Cognitive and Communicative performances of the client have been explained in detail in Table-3. Significant improvements

**Table-3: Pre and Post – therapy communicative and cognitive performance of the client**

S.No.	Parameter	Pre-therapy		Post-therapy	
		Baseline	% (Percentage of response)	Progress	% (Percentage of response)
<b>I</b>	<b>Communicative functions</b>				
1	Comprehension				
	i) Yes/No questions	Absent	0	Responds to Yes questions Responds to No questions	50 10
	ii) Auditory word recognition	Present	50	Remains the same	50
	iii) Sequential commands	Absent	0	Comprehends and executes simple commands	10
	iv) Reading comprehension	Absent	0	Comprehends what he reads	40-50
2.	Spontaneous speech				
	i) Information content	Poor	10	Appropriate response present for questions presented orthographically	70
	ii) Fluency	Fair	60	Remains the same	60
3.	Repetition	Poor	40	Ability to repeat phrases and sentences has improved	80
4.	Naming	Fair	70	Object naming has improved	80
<b>II</b>	<b>Cognitive Functions:</b>				
1.	Eye contact	Present	25	Improved	50
2.	Attention span	10 minutes	0-10	30-60 minutes	30-60
3.	Orientation to space				
	i) Person	Poor	0	Able to recognize family members	50
	ii) Place	Poor	0	Orientation of 'where he is' is present	80
	iii) Time	Poor	0	Able to express day, date and time	50
4.	Facial expression	Expressionless	0	Improved (Able to express joy & frustration)	10
5.	Intonation	Flat	0	Expresses question in raising intonation pattern	10
6.	Topic maintenance	Absent	0	Able to sustain a topic for 5-10 minutes	20
7.	Greeting skills	Present but limited	20	Improved (able to greet bye, good morning / afternoon / night)	50

were noticed in the areas of comprehension, repetition and orientation to space. The client has *progressed from Wernicke's aphasia to transcortical sensory aphasia and the severity of the cognitive impairment has also reduced from moderately severe to moderate degree of impairment*. Slow rate of progress could be attributed to delayed onset of intervention.

It is learnt that adequate care has to be taken while evaluating individuals with RHD. The person with RHD might demonstrate linguistic symptoms consequent to contra-coup injury. It is also evident that early intervention, intensive cognitive therapy and speech & language therapy could considerably improve communication and cognitive performance of individuals with RHD.

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